***Forty Centuries of Ink* by David Nunes Carvalho**
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"It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."

— Arthur Conan Doyle, *A Scandal in Bohemia*[3]

The Beginnings of CSI

The modern science of crime scene investigation has its origins in the mid-nineteenth century. The democratization of practical science together with the rise of organized law enforcement produced a synergy that changed the face of police work forever. This is not to say, however, that the ancients had no regard for forensics. According to Plutarch, the odd circumstances surrounding Alexander's death in 323 B.C. – he was struck down by a mystery illness at the age of 32 – touched off fierce debate among medical experts at the time.[4] In fact, Alexander's cause of death remained a puzzle for more than two-thousand years. It now appears that he may have died of Gullain-Barré Syndrome – the "miraculous" post-mortem preservation of his body noted by his doctors attributable to the fact that Alexander was likely not dead at all when they buried him, merely paralyzed and possibly comatose.[5]

Although the medical dimension of what would become known as CSI advanced considerably between the time of Alexander and the early 19th century, it was still rather haphazard in the first decades of the 1800s. As one historian notes: "When a suspicious death was discovered [in Victorian England], the local police were usually called to the scene, followed by a doctor. The matter was then referred to the coroner, who organized the *post mortem* [examination],"[6] which was typically conducted at "a nearby building such as an outhouse, workhouse infirmary, or even the local pub."[7] There was little formal effort to

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[3] Arthur Conan Doyle, "A Scandal in Bohemia," *Strand Magazine*, vol. 2, no. 7 (1891).
[4] Plutarch, *Alexander*, 76:1-5.
[5] Katherine Hall, *Ancient History Bulletin*, vol. 32, nos. 3-4 (2018).
[6] https://victorian-supersleuth.com/a-brief-history-of-csi/ (last visited, September 12, 2022).
[7] *Ibid*.

preserve the crime scene, "which would be trampled by the coming and going of many people."[8]

Part of the problem lay in the fact that there were few, if any, formalized procedures for conducting forensic examinations at the time. The very first book with any pretense to being a CSI manual was William Augustus Guy's *Principles of Forensic Medicine*, published in 1844.[9] A professor of medicine at King's College London, *Principles* was aimed at medical experts, rather than police. In his book, Guy admonished doctors "to observe the location of the body, its position, the soil or surface on which it was lying, any nearby objects, and the victim's physical appearance and clothing"[10] – all pretty basic advice that was, in truth, little more than a codification of common sense.

It was not until 1881 that a book purporting to establish anything remotely resembling modern CSI protocols appeared. Sir Howard Vincent, head of the Criminal Investigation Department at Scotland Yard (which had been founded just three years earlier), published his *Police Code and Manual of Criminal Law*.[11] Derived from the practices of the Paris police force, Vincent's manual covered a broad range of investigative topics, including procedures for the handling of human remains.[12] He also touched on topics like handwriting analysis[13] and the role of crime scene photography[14] in CSI. The *Police Code* became an instant classic that remained in print – through sixteen editions – for more than forty years.

However, despite its popularity, Vincent's *Police Code* still fell far short of anything that might be described as a systematic or scientific treatise on CSI. Indeed, like Guy's *Principles*, much of what Vincent's book contained could scarcely be classified as science at all – at least not by modern standards. One section is devoted to what are described as "footmarks."[15] The author offers the expected admonitions about protecting such evidence from the destructive forces of wind and rain, and predictably suggests plaster of Paris as a handy means of making permanent copies of "footmark" evidence.[16] However, the patina of scientific authority conferred by the book on the various topics it embraced sometimes proved to be a dangerous thing. In 1876, William Habron was convicted of the murder of a local police constable largely on the strength of "footmark" principles delineated in *Police Code*.[17] Habron was sentenced to life in prison and spent several years behind bars until the real culprit confessed.[18] Henry and Francis Tidbury were not so lucky. Like Habron, convicted largely on the basis of questionable

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[8] *Ibid*.
[9] William Augustus Guy, *Principles of Forensic Medicine* (London: Renshaw) 1844.
[10] https://victorian-supersleuth.com/a-brief-history-of-csi/ (last visited September 12, 2022).
[11] Howard Vincent, *Police Code and Manual of Criminal Law* (London: Cassell, Petter & Galpin) 1881.
[12] Id at 66 *et seq*.
[13] Id at 117-118.
[14] Id at 176-177.
[15] Id at 110.
[16] Ibid.
[17] http://vots.altervista.org/CTI/15Habron.html (last visited September 12, 2022)
[18] Ibid.

"footmark" evidence for the murders of two policemen, the Tidbury brothers were hanged, foreclosing any possibility for subsequent review.[19]

Fortunately, as the nineteenth century wore on, there was substantial progress in the emerging field of CSI – at least some of it taking the form of life imitating art. Sir Arthur Conan Doyle, through his famous fictional detective, Sherlock Holmes, had a powerful influence on the development of CSI techniques. Doyle – a medical doctor – stressed both the potential probity of trace evidence and the care that must be taken to preserve and collect it from complex and often chaotic crime scenes. For example, in "The Boscombe Valley Mystery" (1891), Holmes declares: "Oh, how simple it would all have been had I been [at the crime scene] before the [local policemen] came like a herd of buffalo and wallowed all over it."[20] As one historian says of the impact of Doyle – and his Victorian peers like Edgard Allan Poe, Elizabeth Gaskell and Wilkie Collins – "[t]he[ir] stories showcased new methods of CSI: protecting the crime scene from contamination; preserving and recording the relationships between all objects in the scene, even the most trivial; and submitting minute trace evidence to scientific scrutiny."[21] The use of systematic tools for identification – "mugshot" books, fingerprinting, and crime scene photography – all became essential features of CSI work during the last decades of the 19th century thanks, at least in part, to the work of period crime writers.[22]

On the heels of these literary inspirations, the first proper CSI manual, *Criminal Investigation: A Practical Handbook* (originally titled *Handbuch für Untersuchungsrichter als System der Kriminalistik*) was published in 1893 by Austrian law professor Hans Gross.[23] In many important respects, the book laid the foundation for modern crime scene investigation. Gross' handbook sets out a systematic approach to collecting, analyzing and contextualizing crime scene evidence – indeed, in many ways, he was responsible for creating the modern conception of the "crime scene" – i.e. a fixed set of data that could be isolated, preserved and analyzed. *Criminal Investigation* contains both practical advice ("make sketches," "draw maps," "record all evidence"), as well as conceptual tips that explore the interplay between Holmesian deduction and the scientific method.

In the end, however, Gross' volume ultimately suffers for its extraordinary comprehensiveness. It covers so much ground that the author is unable to plumb any particular topic very deeply. As the editors of one of the first English translations concede in their introduction, "the extent of the [subjects described] forbids . . . completeness."[24] Indeed,

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[19] https://victorian-supersleuth.com/the-hungerford-murders/ (last visited September 12, 2022).
[20] Arthur Conan Doyle, "The Boscombe Valley Mystery," *Strand Magazine*, vol. 2, no. 10 (1891
[21] https://www.manchester.ac.uk/discover/news/sherlock-homes-inspired-real-life-csi/ (last visited September 12, 2022).
[22] https://www.sciencedaily.com/releases/2013/07/130725202333.htm (last visited September 12, 2022).
[23] Hans Gross, *Handbuch für Untersuchungsrichter als System der Kriminalistik* (Graz: Leuschner & Lubensky) 1893. See also from the following year in the same vein *Lehrbuch für den Ausforschungsdienst der k.k. Gendarmerie* *Graz: Leuschner & Lubensky) 1894.
[24] Hans Gross, Criminal Investigation: A Practical Handbook, John & J. Collyer Adam edd. (London: Specialist Press) 1907, p.viii.

the book's main contribution to the field of CSI is not in the novelty of the topics on which it touches, or the quality of the scholarship with respect to any specific subject area; rather, *Criminal Investigation* is mostly important for positing the idea of a formal manual – a formalized process – for carrying out detailed forensic investigations likely to produce reliable evidence. In this respect, it was a significant milestone. Unfortunately, the international impact of *Criminal Investigation* was limited by the fact that it was available initially only in German.

Forty Centuries of Ink

Against this backdrop, David Nunes Carvalho's *Forty Centuries of Ink,*[25] published in 1904 (two years before *Criminal Investigation* first appeared in English), was an extraordinary achievement. Not only did the book define a whole new literary genre in the English-speaking world, it also set a standard for CSI manuals that has not been exceeded to this day. Its meticulous and scholarly approach to a complex subject matter, which is nonetheless accessible to lay readers, has made it an invaluable resource to forensic investigators for over a century.

The true measure of Carvalho's achievement is perhaps best appreciated in relation to the broader picture of the development of the science of CSI in the 20th century. The DOJ's comprehensive 2010 historical report on the "Role and Impact of Forensic Evidence in the Criminal Justice Process" notes how "little published research exists on the uses and effects of forensic science evidence. Early studies in the 1960s and 1970s indicated physical evidence was available at most crime scenes, but little scientific evidence was collected and had minimal impact on case outcome."[26] Indeed, even the FBI did not have a dedicated forensic facility until 1932 when J. Edgar Hoover created the "Criminology Laboratory."[27] However, more than thirty years earlier, Carvalho – using his largely self-taught methods – was already impacting the outcomes of some of the world's most celebrated cases.

Born in Philadelphia in 1845, the son of a prominent early photographer and scientific inventor[28], Carvalho made national headlines in 1900 by helping to unmask the murderer of Texas lumber and railroad magnate William Marsh Rice, the founder of Rice University.[29] Through ink and handwriting analysis, Carvalho established that Rice's lawyer, Albert Patrick, had applied Rice's signature to a forged will in Patrick's favor before conspiring with Rice's valet

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[25] David Carvalho, *Forty Centuries of Ink: A chronological narrative concerning ink and its backgrounds, introducing incidental observations and deductions, parallels of time and color phenomena, bibliography, chemistry, poetical effusions, citations, anecdotes and curiosa together with some evidence respecting the evanescent character of most inks of to-day and an epitome of chemico-legal ink* (New York: Banks Law Pub.) 1904.
[26] https://www.ojp.gov/pdffiles1/nij/grants/231977.pdf (last visited September 12, 2022).
[27] https://www.fbi.gov/history/history-publications-reports/the-birth-of-the-fbis-technical-laboratory1924-to-1935 (last visited September 12, 2022).
[28] Claire Carvalho & Boyden Sparkes, *Crime in Ink* (New York: Charles Scribner's Sons) 1929, p. iii.
[29] https://forward.com/culture/173732/meet-david-nunes-carvalho-the-jewish-investigator/ (last visited September 12, 2022).

to kill him. In significant part on the strength of Carvalho's testimony, Patrick was convicted of first-degree murder.[30]

Around the same time, Carvalho played a principal role in one of the most famous trials of the modern era: the court-martial of French artillery officer, Alfred Dreyfus.[31] Having been falsely convicted by two successive military tribunals, Dreyfus was exonerated in a stunning reversal that made headlines around the world. The final outcome of the "Dreyfus Affair" (as it came to be known) was strongly influenced by Carvalho's testimony regarding the authenticity of a group of conspiratorial letters – the prosecution's key evidence.[32] Carvalho was also instrumental to establishing the guilt of the real culprit: another French officer, Charles Esterhazy.[33]

By 1910, Carvalho's forensic methods were sufficiently widely accepted to be relied upon by the New York State Senate in its investigation of Senate President Jotham P. Allds. His testimony was central to proving the allegations of bribery against Allds, who was ultimately forced to resign.[34] These notable cases represent the tip of a monumental iceberg; Carvalho provided evidence in hundreds of disputes, large and small, civil and criminal, during the early years of the 20th century and was a familiar and respected figure within both the law enforcement community and civil bar.[35]

Fittingly, the 1904 edition of *Forty Centuries*, published by the Banks Law Publishing Company of New York, outwardly resembles a law reporter of the era. Hardbound in brown buckram with black and red leather labels applied to the spine, it is indistinguishable from any volume of the Massachusetts Reports. The text is divided into thirty-two chapters. The first ten present a history of inks, taking the reader, chronologically, from the "Genesis of Ink," through to "Renaissance Ink." Following on, Chapters XI to XIV are devoted to the study and classification of inks; Chapter XV deals with legal inks, and Chapters XVI through to XVIII concern their durability and chemistry. Chapters XIX and XX are devoted to tests that can be used to detect modifications made to documents on the basis of the paper on which they have been written, and to fugitive ink. Chapters XXI and XXII survey recipes for ink and the ink industry. Chapters XXIII and XXIV concern ink in a legal context, most specifically, the admissibility and use of ink-related evidence in court. The final eight chapters concern ink utensils and substrates — ancient and modern.

In view of the foregoing list of contents, it is perhaps unsurprising that *Forty Centuries* remains to this day the single most complete compendium of ink-related information ever produced. The work draws as competently from Dioscorides as it does from the *Boston News-*

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[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] Ibid.
[34] https://archive.org/stream/manualforuseofle00newy_11/manualforuseofle00newy_11_djvu.txt (last visited September 12, 2022).
[35] See Carvalho & Sparkes, *supra*, *passim*.

Letter. Could it be the only published book the index of which finds Pliny and Plato sandwiched between Pinkertons and Plumbago? Indeed, to describe the publication as merely thorough is to understate the achievement of the author. Taken on its own, Carvalho's summary of the antique and medieval sources on inks— many of them difficult to find even now in the open access internet age — is an impressive achievement. However, combining this historical component with both detailed commentary on ink chemistry and thoughtful legal analysis places the book in its own special category. Though often beautifully written and lavishly produced, scientific books of Carvalho's era rarely age well as working texts. *Forty Centuries* is a rare exception. Simultaneously comprehensive and profound, the volume reads like a carefully assembled anthology of expert journal articles – categorical in its presentation of the science of its time, but also prescient in its anticipation of the further progress that was to come.

Conclusion

Over the 118 years since the first publication of Carvalho's book, forensic science has acquired a vast suite of new techniques and equipment aimed at advancing the task of crime scene investigation broadly, and questioned document analysis specifically. Along these lines, it is helpful to remember that it was only in 1926, the year after Carvalho died, that Jean Perrin received the Nobel Prize for his work establishing the atomic nature of matter, finally putting to rest the 19th century's lingering doubts about the existence of molecules.[36] CSI has certainly come a long way since then. Judges and juries now take for granted technology that allows investigators to examine the modern-day crime scene at the level of a few molecules, and to scrutinize documents at the level of small clusters of atoms.

Presaging such evolution, perhaps, Carvalho wrote in his preface to *Forty Centuries*: "This work will no doubt be variously considered. Criticism is expected, indeed it is gladly invited, for thereby may follow controversy, discussion and perhaps legislation which will bring about results beneficial to those who are to follow after us."[37] Precisely how much Carvalho anticipated about the technical changes that lay ahead is necessarily a matter for speculation, but the continued usefulness of his book, despite the sea-changes of the last 100 years, suggests that he foresaw at least some of the direction the progress in his field would take. In short, during an unprecedented age of rapid scientific development, *Forty Centuries* was a breakthrough accomplishment with near-singular longevity – in its own small way, a forgotten masterpiece.

[36] https://www.nobelprize.org/prizes/physics/1926/perrin/facts/ (last visited September 12, 2022)
[37] David Carvalho, *supra*, at p. iv.